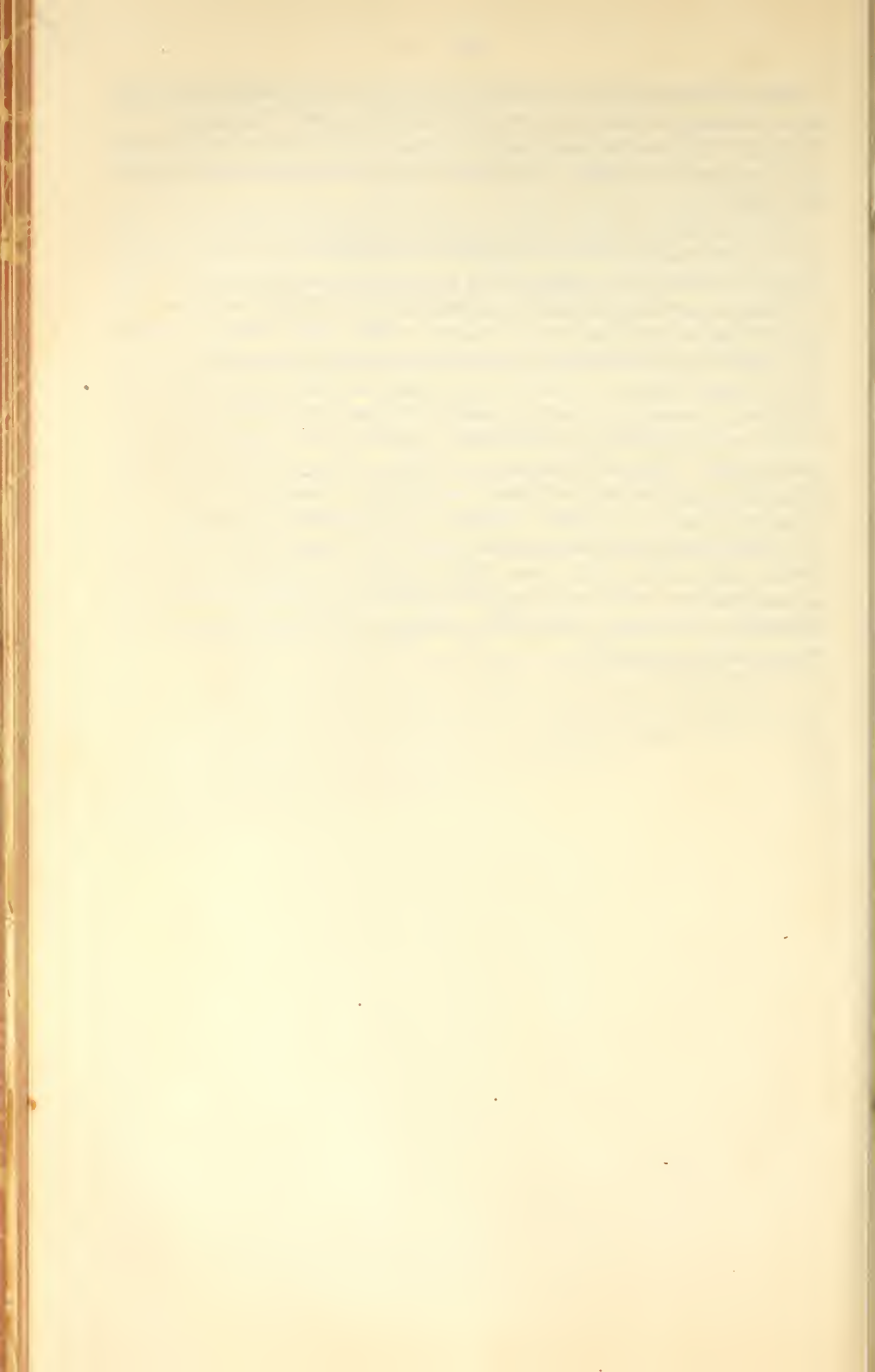
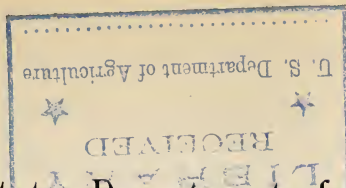


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## THE HESSIAN FLY SITUATION IN 1915.

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The Hessian fly has during the past season inflicted immense damage to the wheat crop throughout an area extending from north-eastern Oklahoma and northern Arkansas northward through Kansas, Missouri, Nebraska, and southern Iowa, and eastward including principally the States of Illinois, Indiana, Ohio, and Pennsylvania. The loss to the 1915 wheat crop from its ravages will undoubtedly amount to millions of bushels.

Nothing can be done now to lessen the damage to the present growing crop; all efforts put forth at this time must be with a view of protecting as far as possible from Hessian fly attack the millions of acres of wheat that will be sown throughout this area during the coming months of September and October. *No wheat should be sown in August.*

During the period from June to October, 1914, the Department issued repeated warnings and advisory statements through the public press and its weekly news letters, telling farmers that there was impending danger of a serious outbreak of the pest during the year 1915. These warnings, based on observations made from field stations throughout the entire area of the threatened outbreak, were not for the purpose of creating undue alarm, but were fully justified in view of the great abundance of the Hessian fly at that time and the almost entire absence of the particular species of parasite or natural enemy that is most influential in holding the pest in check. Attention is called to this at the present time for the sole purpose of again offering advice to farmers, with the hope that they will generally profit by last year's experience.

The Hessian fly attacks wheat, rye, and barley, but not oats or other grains.

### STAGES AND LIFE OF THE PEST.

Although this pest has been present in the wheat fields of the American farmer for considerably over a century, comparatively few are able to recognize it, excepting in what is known as the "flaxseed"

stage, which even then is often mistaken for the egg. In order, therefore, to understand the situation fully, it is necessary to know what the fly is like, how it is capable of causing such enormous losses, and how it transforms from the egg to the fully developed insect.

There are two generations of the Hessian fly each year, one in the fall and one in the following spring, the latter being the children of the former. Therefore, if there were no flies to lay eggs in the fall, it stands to reason that there could be none to lay eggs in spring.



FIG. 1.—Position of full-grown Hessian-fly larvæ as frequently observed on the lower part of the stem of wheat, the sheath being drawn back so as to expose them. If the plants are small at the time of egg laying, the larvæ are in consequence near the base of the plant, as here shown. Slightly enlarged. (Original.)

pupal or resting stage of the insect. Farmers often confuse these "flaxseeds" with the eggs, when, if they would but think for a moment, they would see that none but very large insects could possibly lay an egg of that size. Neither the maggot nor the "flaxseed" leaves the plant on which it originated. From the "flaxseed" will issue the fly, which has already been described.

Beginning about the 1st of April, as shown in figure 4, flies emerge from the "flaxseed" that have passed the winter in the fall wheat, whether early sown or volunteer. These flies deposit their eggs on the leaves of the uninfested plants, the eggs hatch into maggots in

In the course of its development the insect passes through four different stages, all of which are shown in the seasonal history diagram (fig. 4). The adult is a small, long-legged, dark-colored fly, very much resembling a small mosquito. The egg is very small, long, slender, and of a shining reddish color, and is placed by the female fly in the grooves on the upper surface of the wheat leaves, both in spring and fall. It can be observed by any farmer who will take a leaf and stretch it over his finger, allowing the sunlight to fall directly on it. The maggot hatches from the egg, makes its way down the leaf, and wedges itself between the leaf sheath and the stalk of the plant, where in some cases a dozen or more may be found partly overlapping one another. (See fig. 1.) When it becomes full grown its skin hardens, changing to brown, and from its form and color it is then commonly known as the "flaxseed," which is the

from 4 to 8 days, and the maggots become grown in about 20 to 30 days and then change to "flaxseeds." This constitutes the spring generation. After harvest the "flaxseeds" of this generation can be found in the stubble just above the ground, or often higher up where the straw has broken over.

The first flies of the second or fall generation begin to issue from the "flaxseeds" about the middle of August and continue to issue till about the last of October, according to latitude, the maximum emergence occurring during the last two weeks of September or the first week in October, depending on the locality. This second main generation infests volunteer wheat and all wheat sown before the fly-free date. The "flaxseeds" of the second generation remain on the plants of fall-sown wheat till April of the next year, when adults issue from them and begin another season.

The diagram, figure 4, represents the seasonal history of the Hessian fly throughout the entire year.

#### APPEARANCE OF INFESTED PLANT.

No farmer need be in the least uncertain as to the extent to which his wheat is infested in the fall. An infested plant stands straight upward in the drill row, with broader leaves of a darker green color, does not tiller, and therefore does not spread out and cover the ground between the rows. Figure 2 shows an infested plant, while figure 3 shows a plant uninfested.

#### METHODS OF CONTROL.

The Hessian fly will be in the "flaxseed" stage in the stubble from early June to October in the South, and in the North from late June till late September. Therefore *all* stubble fields, whether to be planted to wheat or not, if unseeded to grass, should first be burned if possible; if not possible, disked. They should then be deeply plowed by the middle of July or the first of August, in order to destroy the "flaxseeds." Fields that are to be burned should be plowed in small lands; a land should be laid off and firebreaks plowed around it for protection. Only that portion of the field that can be plowed in two or three days should be burned at a time. If disking is the preferred method, then the entire field should be disked immediately after the wheat is cut. This operation not only conserves the moisture and makes plowing easier, but will also start the volunteer wheat, which should invariably be plowed under. Plowing should be begun as soon after disking as possible.

Nowhere, either in the East or West, should wheat be sown on wheat stubble if this course can possibly be avoided. However, in the East, as well as in some portions of Iowa and Missouri, the wheat stubble is universally seeded to timothy and clover, and

therefore any kind of cultivation of these stubble fields is rendered impracticable, though in many cases it would be far better to sacrifice all except the very best seeding. Neither can they be burned over without destroying the young seeding, and where these conditions prevail the only practical method that the farmer can use is that of



FIG. 2.—Young wheat plant infested by the Hessian fly. (From Webster.)

delaying his wheat sowing until the flies have made their way from the stubble to the fields and died there without being able to find any plants upon which to deposit their eggs.

It should be borne in mind that the most practical and effective methods of controlling the Hessian fly are identical with the best methods of producing the maximum yields of wheat. It does not seem to occur to the average farmer that it is possible for him to

fight the Hessian fly by the process of good farming, involving thorough cultivation, good seed, and a rotation of crops. It has been said, and with truthfulness, that outbreaks of this pest are more often the result of poor farming than otherwise. The most serious objection to the most practical and effective method that



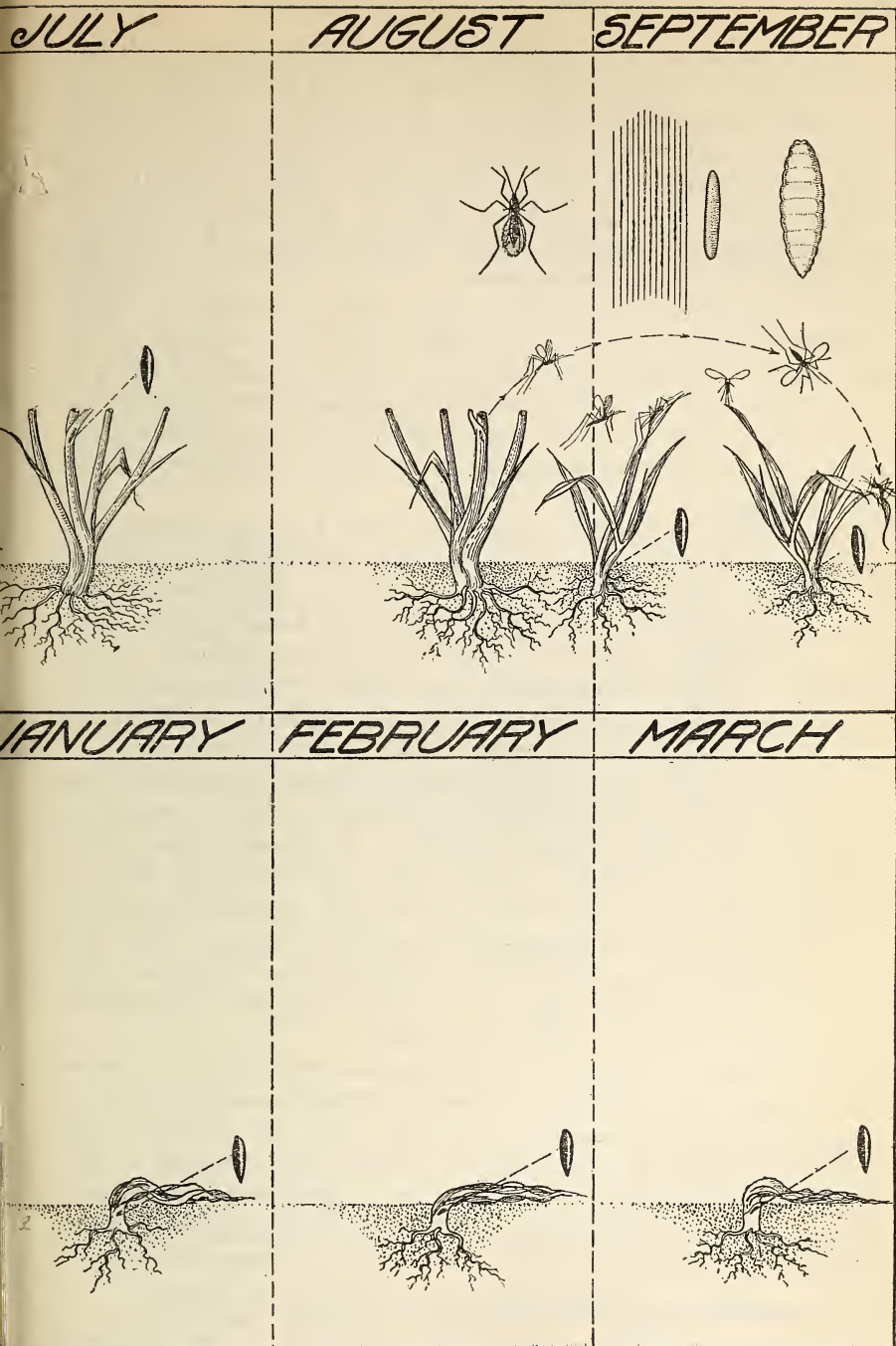
FIG. 3.—Healthy, uninfested young wheat plant. (From Webster.)

can be employed to control this pest in the field—namely, late sowing—is that there is danger of so delaying the growth of the plants that they do not become sufficiently advanced to enable them to withstand the winter. The farmer is thus placed, as it were, between Scylla and Charybdis, and must risk the ravages of the Hessian fly on the one hand or the freezes of winter on the other.



FIG. 4.—Seasonal development of the Hessian fly from egg to adult and their position on the plant, the adults migrating from stubble to young wheat plants in the fall. Slight





the year. The diagram shows the different stages of developing wheat plants to uninfested plants in the spring, and adults d. (Original.)



FIG. 4.—Seasonal development of the Hessian fly from egg to adult twice during the year. The diagram shows the different stages of development and their position on the plant, the adults migrating from overwintering wheat plants to uninfested plants in the spring, and adults migrating from stubble to young wheat plants in the fall. Slightly enlarged. (Original.)



Much of the delay in the growth of late-sown plants in the fall can be eliminated by paying close attention to the preparation of the soil and to the quality of the seed. A thoroughly vigorous wheat plant will not only withstand a slight attack of the Hessian fly, but it frequently occurs that such a light attack is rather beneficial than otherwise, for the reason that the killing of the first shoot that is thrown up from the kernel forces the plant to tiller, and in rich soil the result is to produce more grain; but if the soil lacks in fertility and has been poorly prepared, this slight attack that vigorous plants overcome is fatal, because of the badly nourished condition of the plant itself. The best advice that can be given is to begin the preparation of the field in the fall precisely as though it was expected to sow at a very early date, but instead of sowing use the disk harrow and the roller, even after it appears to be a waste of labor to till the field further.

When a finely pulverized, compact seed bed has been secured, the seed should be selected, and this should be done with the point in view that unnaturally shriveled or otherwise imperfect kernels can not produce healthy wheat plants. When the kernel sprouts it at once sends fibrous roots down into the soil from which to draw nourishment for the young plant, and if little or no nourishment is secured the wheat plants are put into somewhat the condition of stunted calves, pigs, or other farm animals which are underfed.

Wheat plants can not secure prompt and ample nourishment if the roots must make their way about among clods due to poor preparation of the soil, or in soil that lacks in fertility. The farmer, then, should begin the preparation of his soil with the object of delaying the sowing of the wheat and afterwards of pushing the growth of the plant to the utmost until the beginning of the cold weather. There are farmers who grow wheat continuously year after year but who rarely lose a crop on account of Hessian-fly attacks, and even more rarely does the pest originate in their own fields.

It must always be borne in mind that it is possible for a careless farmer, or one who insists upon sowing his wheat before the flies have appeared and disappeared, to raise up in the fall a brood large enough—wintering in the "flaxseed" stage and emerging in the spring—to spread out over the fields of his neighbors and destroy their crop, even though these neighbors may not themselves have produced enough of the flies to cause them any damage whatever.

#### SOWING SEED AFTER BEGINNING OF FLY-FREE PERIOD.

According to the experimental sowings carried on for a series of years, the approximate date of sowing wheat to evade the Hessian fly during years of normal rainfall between July 1 and October 1, throughout the States previously enumerated, has been determined according to the accompanying map. (Fig. 5.) Examine the map

closely to determine the date to begin sowing your wheat, compare with experiences of other years of normal rainfall, and advise all your neighbors of this date. One stubble field with its volunteer wheat plants will infest a whole neighborhood in the fall, or one field sown before the fly-free date will often supply the entire locality with enough flies for serious damage the following spring, whether the fields are sown late or early. Farmers should cooperate in this matter.

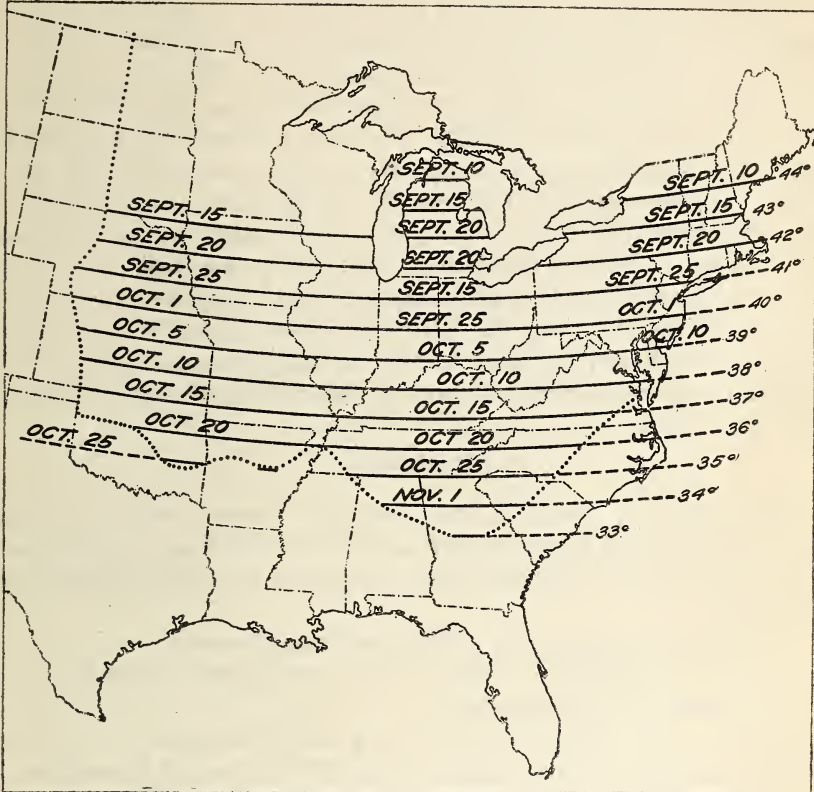


FIG. 5.—Map showing approximate dates in the fall, in various parts of the country, after which, under normal meteorological conditions, wheat may be sown without exposing it to serious attacks of the Hessian fly. The dotted line indicates the southern and western boundaries of Hessian fly distribution in the eastern United States. Owing to the influence of humidity and elevation on the time of appearance of the adults in the fall, the dates after which wheat can be sown with safety vary as between the semiarid West, the region of the Great Lakes and Middle West, and the Appalachian Mountain region. (Original.)

There are some points with regard to the foregoing information that all farmers within the fly-infested district must take into account. These farmers should, above all others, be most familiar with the conditions of their own localities as to weather, soil, and latitude. They should also of all others be the most familiar with their own fields. No one can lay down an exact date upon which each and

every farmer may sow his wheat and be assured of absolute immunity from Hessian fly attack. Dry weather retards the development of the fly and also that of the most important of its natural enemies, precisely as it retards the coming up of the wheat if it be sown in very dry soil and without sufficient rainfall. Again, there is an approximate difference of about one day to each 100 feet of elevation. In this publication we have endeavored to give him approximate information—the best that we have been able to secure in years of investigation and experimentation. But after this has been done it devolves upon the farmer himself to use his own judgment as to when he can sow his own wheat with the greatest safety from attack by this pest. If there should be a general drought throughout the country through July and August, the effect would be to retard the appearance of the Hessian fly from the wheat stubble. We have known several instances where drenching rains swept across the country in narrow strips, producing conditions therein that brought out the fly from the stubble at dates in advance of those on which it would emerge in the dry areas on either side. No one can foretell such occurrences and no one but the farmer himself can take advantage of them. As a last word, then, the farmer should act on the information here given, in accordance with his own best judgment, or that of the most successful wheat growers in his own section of country, particularly of that to the east and west of him.

#### SUMMARY.

The Hessian fly, being in the "flaxseed" stage in wheat stubble and in unharvested wheat from June till September, or even October in the South, can be destroyed by carrying out the following methods of control:

1. Burn where possible all stubble and ruined wheat.
2. Disk all stubble and ruined wheat immediately after harvest, where burning is impracticable.
3. Plow under deeply all stubble and ruined wheat fields, whether burned or disked, before August 15, and roll the ground if possible.
4. Harrow down, disk, pasture, or otherwise effectually destroy all volunteer wheat.
5. As a measure preparatory to sowing, plow as early and deeply as existing conditions will permit; disk, harrow, and roll until a thoroughly pulverized, compact seed bed is obtained.
6. Never sow wheat on stubble if possible to avoid doing so.
7. Do not sow wheat until after fly-free date, approximately as shown on map.



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